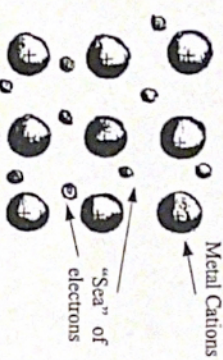
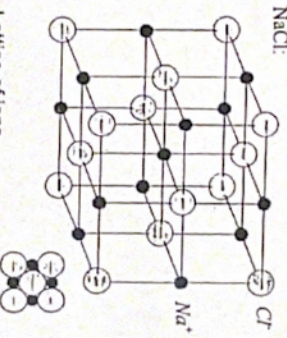
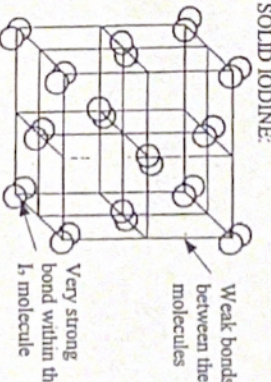
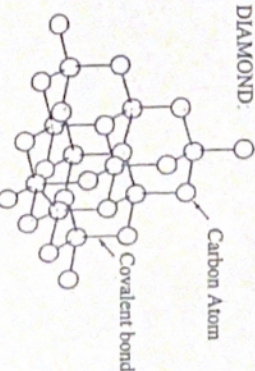


## PROPERTIES, STRUCTURES AND BONDING OF ELEMENTS AND COMPOUNDS

	METALLIC	IONIC	COVALENT MOLECULAR	COVALENT NETWORK
<b>EXAMPLES</b>	Cu, Al, Zn, Ca, Hg	NaCl, NaOH, CaSO <sub>4</sub>	H <sub>2</sub> O, CO <sub>2</sub> , H <sub>2</sub> , N <sub>2</sub> , NH <sub>3</sub>	SiC, SiO <sub>2</sub> , diamond
<b>PROPERTIES</b>				
1. Melting and boiling points	Most are high	High	Low	Very High
2. Electrical Conductivity	Solid and liquid: conductor	Solid: non-conductor Liquid (molten) or in solution: conductor	Solid and liquid: non-conductor	Non-conductor
3. Hardness and malleability	Soft to hard. Malleable	Hard and brittle	Most are soft. Mainly gases and liquids at room temperature	Very hard and brittle
4. Solubility	Generally insoluble in liquids	Soluble in polar solvents	Soluble in polar or non-polar solvents	Insoluble in all solvents
<b>STRUCTURE</b>				
1. Constituent particles	Atoms and valence electrons	Ions	Non metal atoms or molecules	Atoms
2. Diagram	 <p>Metal Cations "Sea" of electrons</p>	 <p>NaCl: Cl<sup>-</sup> Na<sup>+</sup></p>	 <p>SOLID IODINE: Weak bonds between the molecules Very strong bond within the I<sub>2</sub> molecule</p>	 <p>DIAMOND: Carbon Atom Covalent bond</p>
3. What forms the bonds	Lattice of metal cations (become charged to achieve noble gas state). Electrons move through the crystal and shared by all cations. Electrostatic attraction is strong.	Lattice of ions Rigid structure Electrostatic attraction is strong.	Lattice of molecules weakly attracted by secondary bonding. Electrostatic attraction is strong within molecules due to sharing of electrons.	Lattice of atoms strongly attracted by covalent bonding: "giant molecule". Electrostatic attraction is strong throughout the crystal.
<b>EXPLANATION OF PROPERTIES</b>	Metallic bonds are not disrupted by atoms sliding past each other. The bonds are not rigid but are very strong. Mobile electrons may conduct electricity	A strong impact may disrupt the lattice causing like charged ions to align and hence repel. Bonds are strong but rigid. Only when melted or dissolved are ions free to move and hence electricity can conduct.	Solids are easily melted (and generally soft) and most are liquids and gases due to very weak bonds between different molecules. No charge carriers hence non conducting.	Extremely strong covalent bonds throughout the crystal. Hence very high melting and boiling points and very hard.
<b>TYPICAL USES</b>	Building Materials Electrical wiring	Soluble N, K or P compounds: Fertilisers	Fuels and solvents Manufacture of plastics	Abrasives Cutting tools